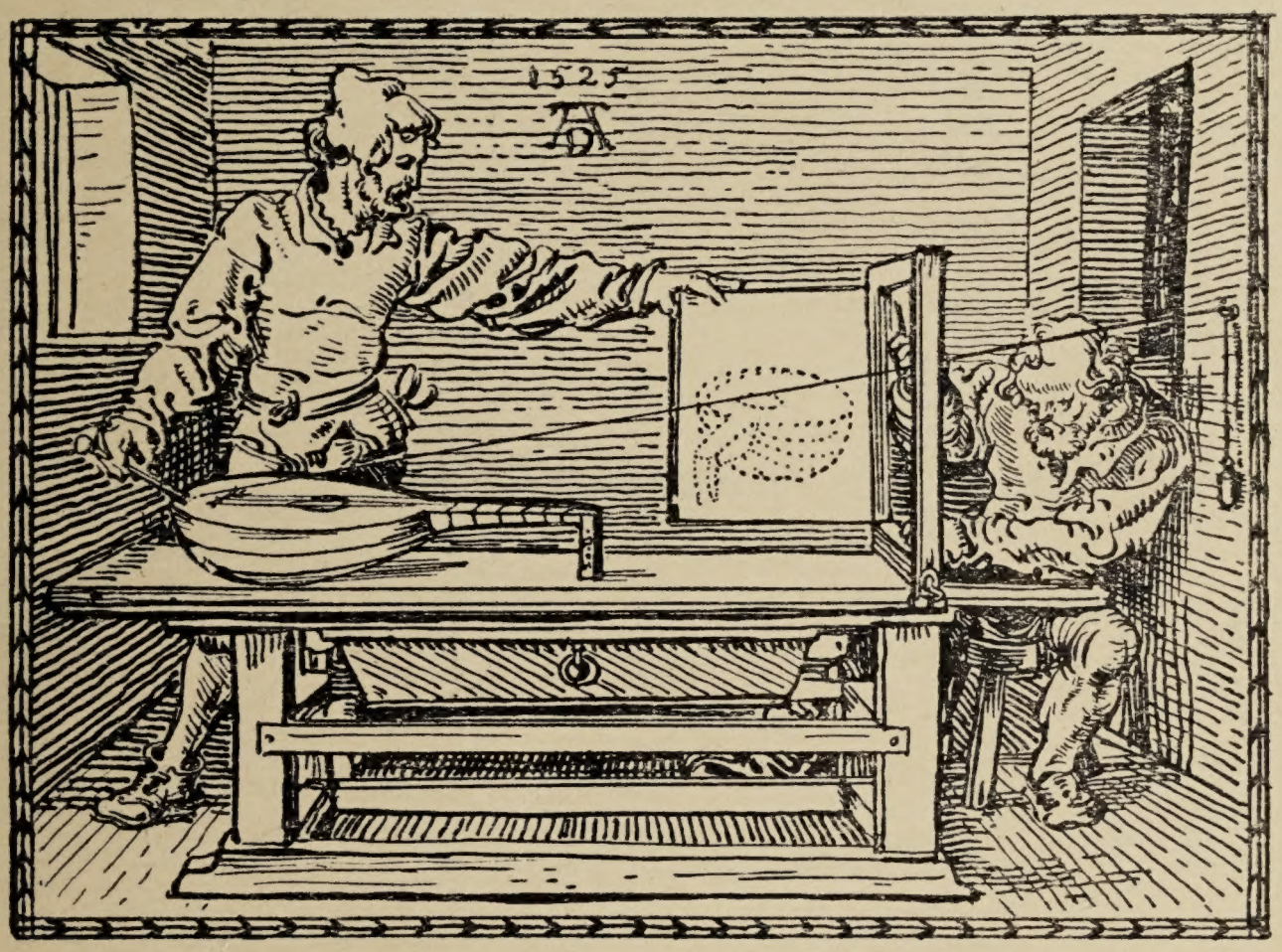
ART BULLETIN NUMBER ONE

ELEMENTARY PERSPECTIVE



An Artist drawing a Lute, after ALBRECHT DÜRER, from a treatise on "Perspective and Measuration," 1530

A. Lismer

DEPARTMENT OF EDUCATION, ONTARIO

TORONTO
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NOTE

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Later, the Department of Education of Ontario, acting upon the advice of several experts in art and in teaching, acquired the rights and revised the material.

These Bulletins are issued to any persons in the Province of Ontario who are interested in any of the phases of art covered by the Bulletins, and desirous of self-improvement.

It is the hope of the Department of Education that the matter and the illustrations are sufficiently clear and simple to enable the individual to work out the elements of the subject himself.

Messrs. Ralph McMullen, H. McCrea, Herbert Palmer, Frank Carmichael, Arthur Lismer, Alfred Howell, and S. W. Perry have all had some part in the preparation of these Bulletins.

Copies of the Bulletin may be obtained free on application to the Department of Education, Parliament Buildings, Toronto.

CONTENTS

ELEMENTARY PERSPECTIVE

THE THIRD DIMENSION

Objects possess three dimensions—height, width, and depth. The representation of the first two depends upon a recognition of their relative proportions to one another and to the various parts of the object or objects to be drawn.

How high is the object, or parts of the object, in terms of the width, or how wide in terms of the height? Both may be shown by a drawing, reduced in size it may be, on a flat surface, without any conflict between fact and appearance. But the representation of the third dimension—depth or distance, depends upon the recognition and application of certain facts known as the "Laws of Perspective."

DEFINITION OF PERSPECTIVE

Perspective is both a science and an art. It is the science governing the apparent size and shape of any object when seen from a given point.

It is the art of representing upon a flat surface, for example a sheet of paper, an object as seen, irrespective of what is known as to its size and shape.

To illustrate: As one looks across a level farming district from a neighbouring hillside, a succession of rectangular fields is seen. Contrary to what is known, the more distant fields

appear smaller than those near at hand, the adjacent corners of neighbouring fields appear not to be right angles, but alternately obtuse and acute. The receding fences, though parallel, appear to be converging; and the fences running at right angles to the former appear to be gradually closing from the rear forward towards the spectator. An understanding of the laws which govern these appearances is necessary to ensure accuracy in drawing.

LAWS OF PERSPECTIVE DEDUCED FROM OBSERVATION

After carefully observing the receding lines of a street, of a street railway, of a row of houses, or of a succession of telegraph poles, this fact will become apparent. Parallel receding lines have a tendency to meet in the distance. Further, in a level district they apparently do meet at a point in the horizon, that is, at the spectator's eye level. This appearance may be stated as a law for our guidance in drawing.

Law of Convergence

Parallel horizontal receding lines (P.H.R. lines) must be drawn to meet at a point called the vanishing point (V.P.) in the horizon, or eye level (E.L.). (Examine Figure 1.)

Looking again at the same group of objects, we observe that objects of the same depth, or situated at similar distances apart, appear gradually to shorten their depth, or the spaces between them.

Examine again the representation of this appearance in Figure 1. The windows gradually become narrower, the spaces between them, between the railway ties, and between the telegraph poles gradually shorten forward.

We may now state a second and more difficult law to express in a drawing.

Law of Foreshortening

Similar spaces between objects or parts of objects must be drawn gradually narrower as they recede into the distance.

The laws of diminution in size and of indistinctness in shape of objects receding into the distance are self-evident corollaries of these two great laws of perspective.

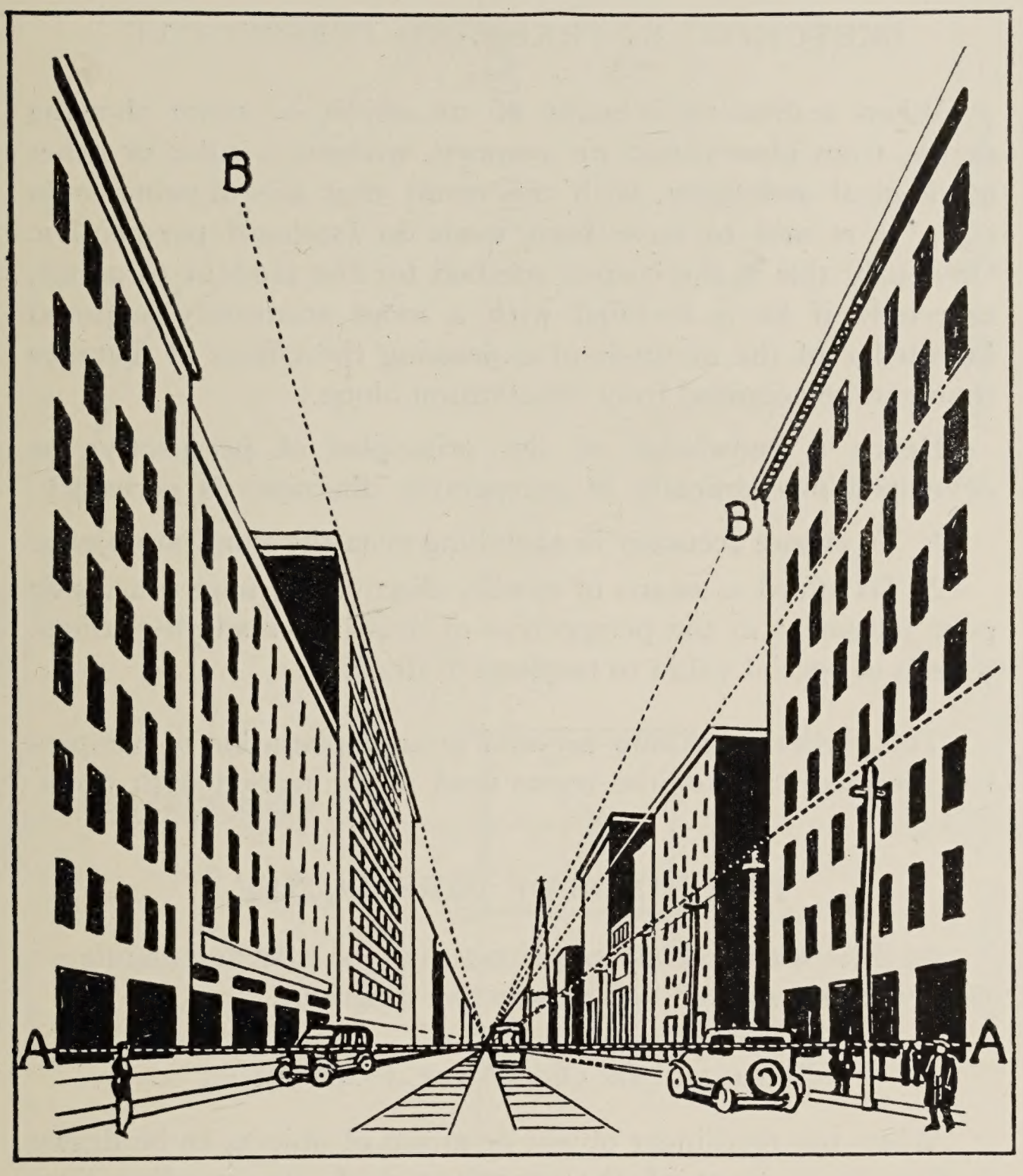


Figure 1

The student may verify these laws, deduced from his observation of common scenes and objects, by studying the perspective of good drawings by reputable artists. By means of a ruler find the vanishing point of the parallel horizontal receding lines of the picture. Through this point draw a horizontal line. This line will mark the position of the horizon, or the eye level, of the drawing.

SKETCHING IN FREEHAND PERSPECTIVE

When a drawing is made of an object or scene showing depth, from observation or memory, without a ruler or other mechanical assistance, with the result that the drawing *looks right*, it is said to have been made in freehand perspective. Obviously this is the correct method for the student to adopt, especially if he is fortified with a more accurately acquired knowledge of the methods of expressing the effects of distance than can be acquired from observation alone.

Hence a knowledge of the principles of perspective as developed mechanically in perspective diagrams is necessary:

1. To ensure accuracy in sketching even the simplest objects.

2. To afford a means of readily discovering inaccuracies or poor judgment in the perspective of drawings made by others. This is of special value to teachers of drawing.

This Bulletin will now proceed to an explanation of perspective diagrams and of the terms used in connection with them.

TWO KINDS OF PERSPECTIVE

As there are two kinds of perspective—parallel and angular—there will be required two perspective diagrams.

Parallel, or One Point, Perspective

When the rectilinear object or group of objects to be drawn is directly in front of the spectator, with the receding lines vanishing in that point in the horizon, or eye level, at which the spectator is looking, and with other lines at right angles to these receding lines and parallel with the horizon and the bottom of the drawing, the drawing of such an object or group of objects is said to be in *parallel perspective*. There can be but one vanishing point. The drawing in Figure 1 is in parallel perspective.

The drawings of the cube A in Figure 2, and of the cubes H, E, B, in Figure 3 are correct for parallel perspective.

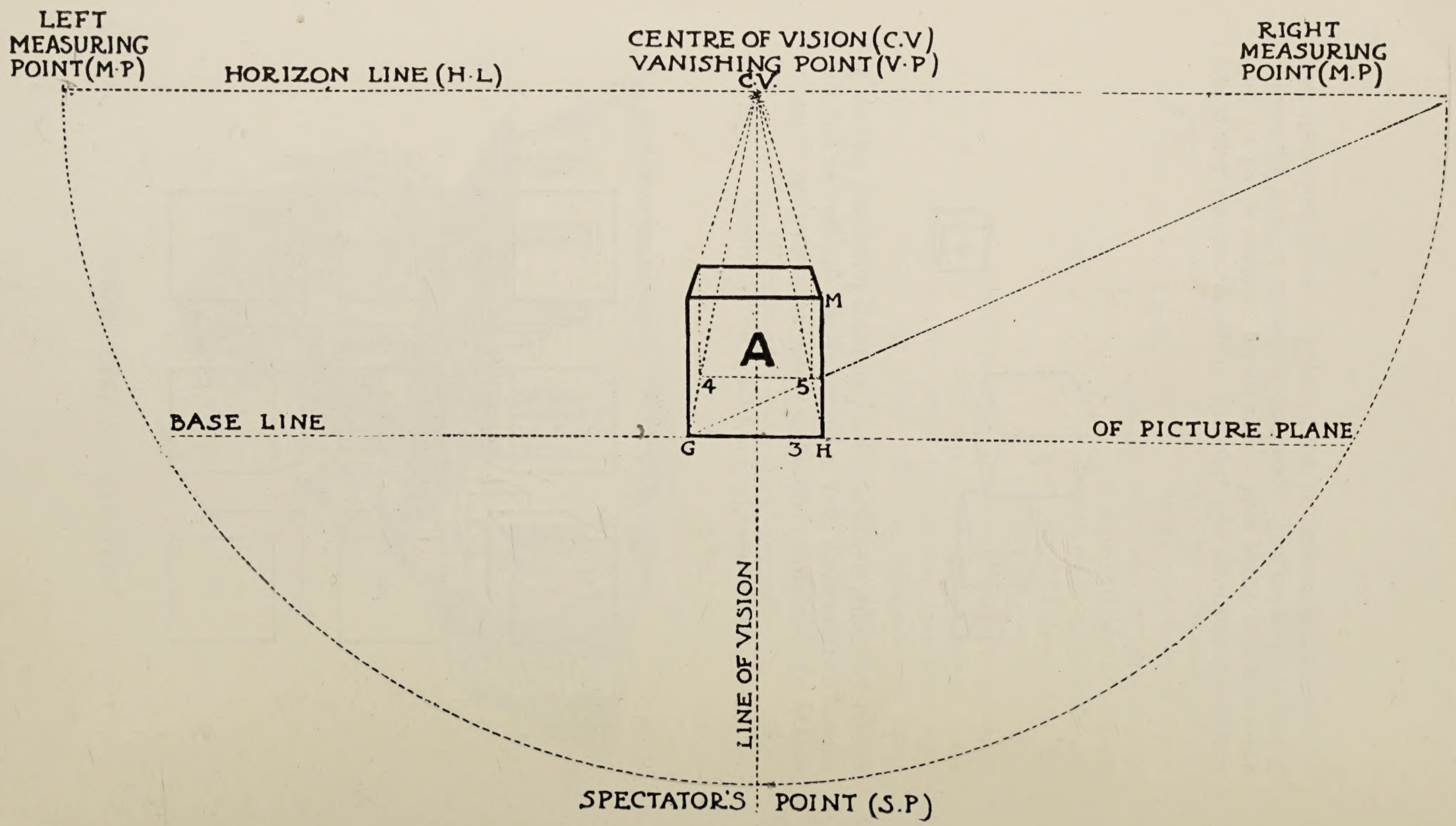

LEFT
MEASURING
POINT(M·P)
HORIZON LINE (H·L)
CENTRE OF VISION (C.V)
VANISHING POINT (V·P)
C.V
RIGHT
MEASURING
POINT(M.P)
M
A
4
5
BASE LINE
OF PICTURE PLANE
G
3
H
LINE OF VISION
SPECTATOR'S POINT (S.P)

Figure 2

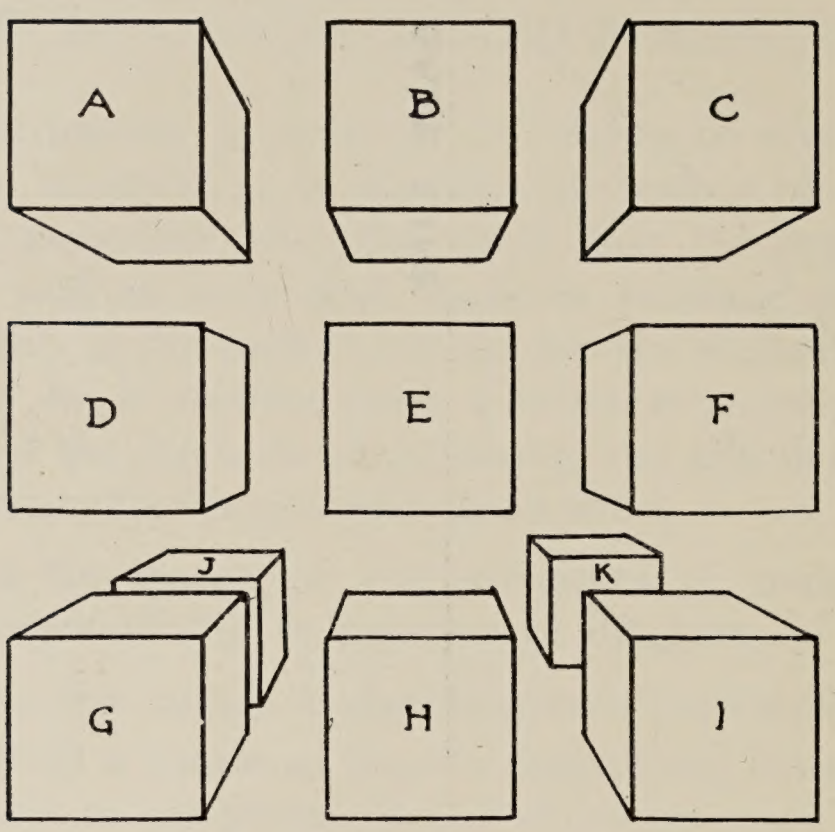


Figure 3

Angular, or Two Point, Perspective

When the rectilinear object or group of objects to be drawn presents an angle to the spectator, so that there are two groups of parallel horizontal receding lines, one group vanishing to the

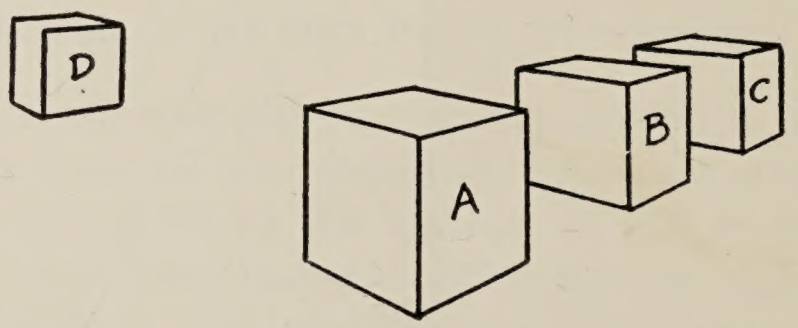


Figure 4

right, and another group to the left, the resulting drawing is said to be in *angular perspective.* This gives a much more interesting view of an object or scene. The cubes in Figure 4, and the school-house in Figure 5 are in angular perspective.

Figure 5

TERMS USED IN PERSPECTIVE

1. The Picture Plane (P.P.)—

The word "perspective" is derived from two Latin words meaning *to look through*, and naturally suggests the idea that there is something through which the spectator is looking. This imaginary transparent plane may be likened to a large sheet of glass upon which the object or scene to be drawn is assumed to be projected from the side opposite to the spectator. The picture, as imagined on this picture plane, is then supposed to be transferred at a reduced scale to the plane of the paper upon which the spectator is making his drawing. (See the circular picture plane in Figure 6, and the rectangular picture plane in Figure 7.)

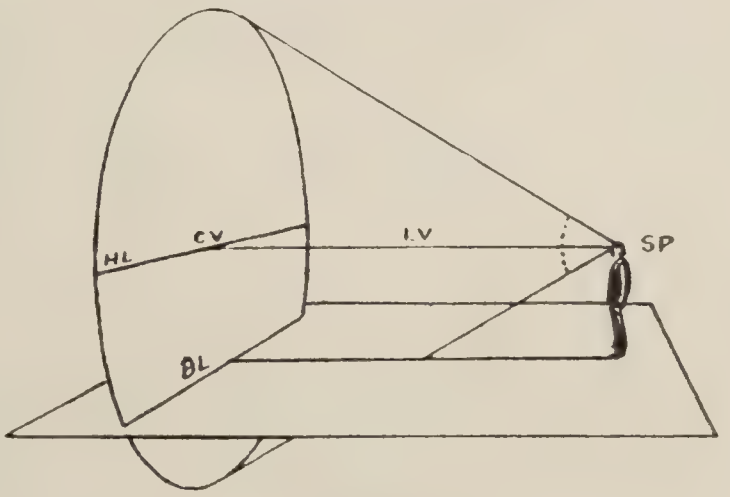


Figure 6

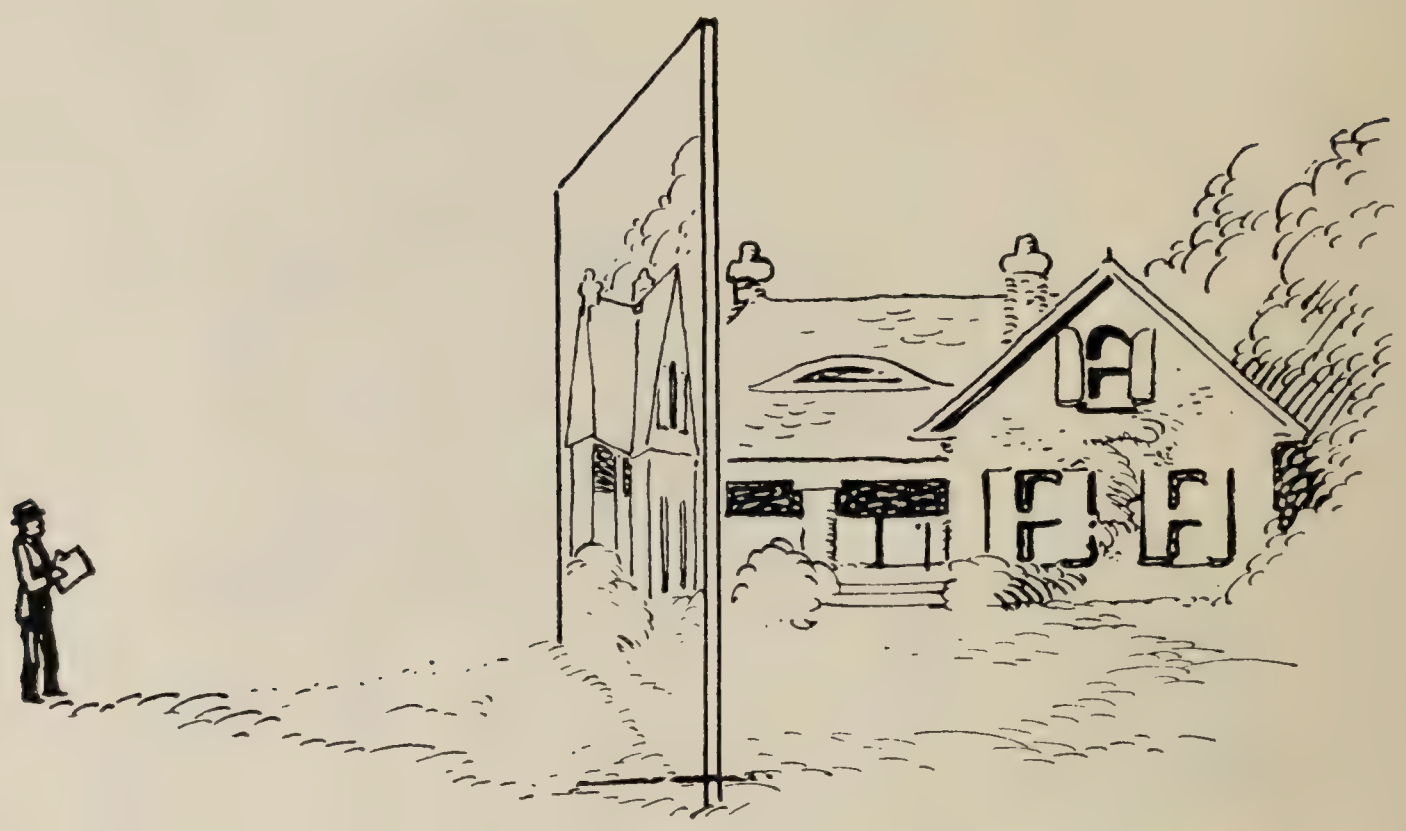


Figure 7

2. The Ground Line (G.L.), or Base Line (B.L.), of the Picture Plane—

The range of the eye is limited. The human eye can cover only about 60° of a circle at one view. As there are 360° in a complete circle, one would have to take six different views to cover the complete horizon about him. (See Figure 8.) The range is limited not only to right and left, but also above and below the eye level. We cannot see what is immediately about our feet and above our heads while looking towards the horizon line. (See Figure 6.) Consequently, the picture plane is imagined to be set up on the ground at a reasonable distance from the spectator. The ground line, or base line (G.L. or B.L.), of the picture plane is, therefore, the line of intersection of the picture plane and the ground. (Again examine Figure 6.)

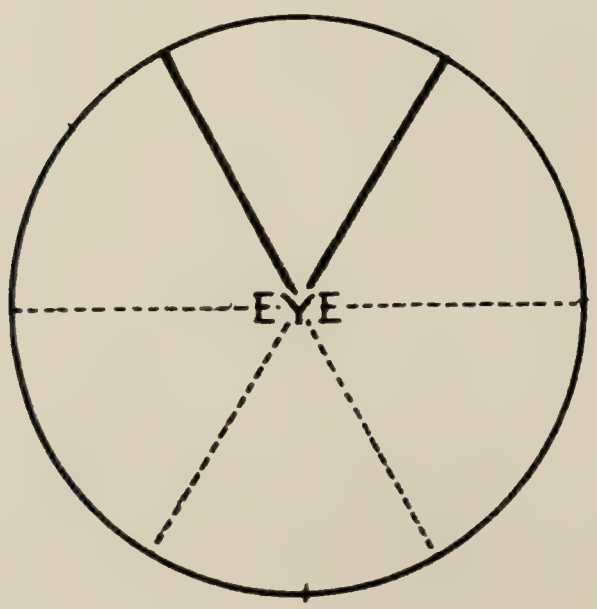


Figure 8

3. Spectator's Point (S.P.)—

This term is used to represent the point from which the picture is seen.

4. Line of Vision (L.V.)—

This is the direct line or central ray which extends from the eye to the horizon line, and which is always directly in front of and on a level with the eye.

5. Centre of Vision (C.V.)—

This is the point in the horizon at which the spectator is looking, and which the line of vision connects with the spectator's point.

6. Horizon Line (H.L.), or Eye Level (E.L.)—

This is a horizontal line which is always on a level with the observer's eye, and which depends upon the height of the observer. On it all parallel horizontal receding lines will meet.

In a level district, as on the prairie or at sea, it corresponds with the horizon.

Where the view is obstructed, as within doors or among hills or buildings, it corresponds with the spectator's eye level.

There can be *only one horizon line* in any drawing, and *all parallel horizontal receding lines must converge at some point along it.*

Parallel receding lines which are not horizontal but sloping up or down, like railway lines on an up or down grade, or like the sloping ends of the roof of a house or of the half-open lid of a box, converge to points at different levels.

These are called *accidental vanishing points (A.V.P.)*, or *oblique vanishing points (O.V.P.)*.

7. Height (H.)—

The height is the distance from the ground level to the eye of the spectator. It is represented in the perspective diagram by the distance up the line of vision from the base line to the horizon line. (See Figures 1, 2, 6, 7, and 9.)

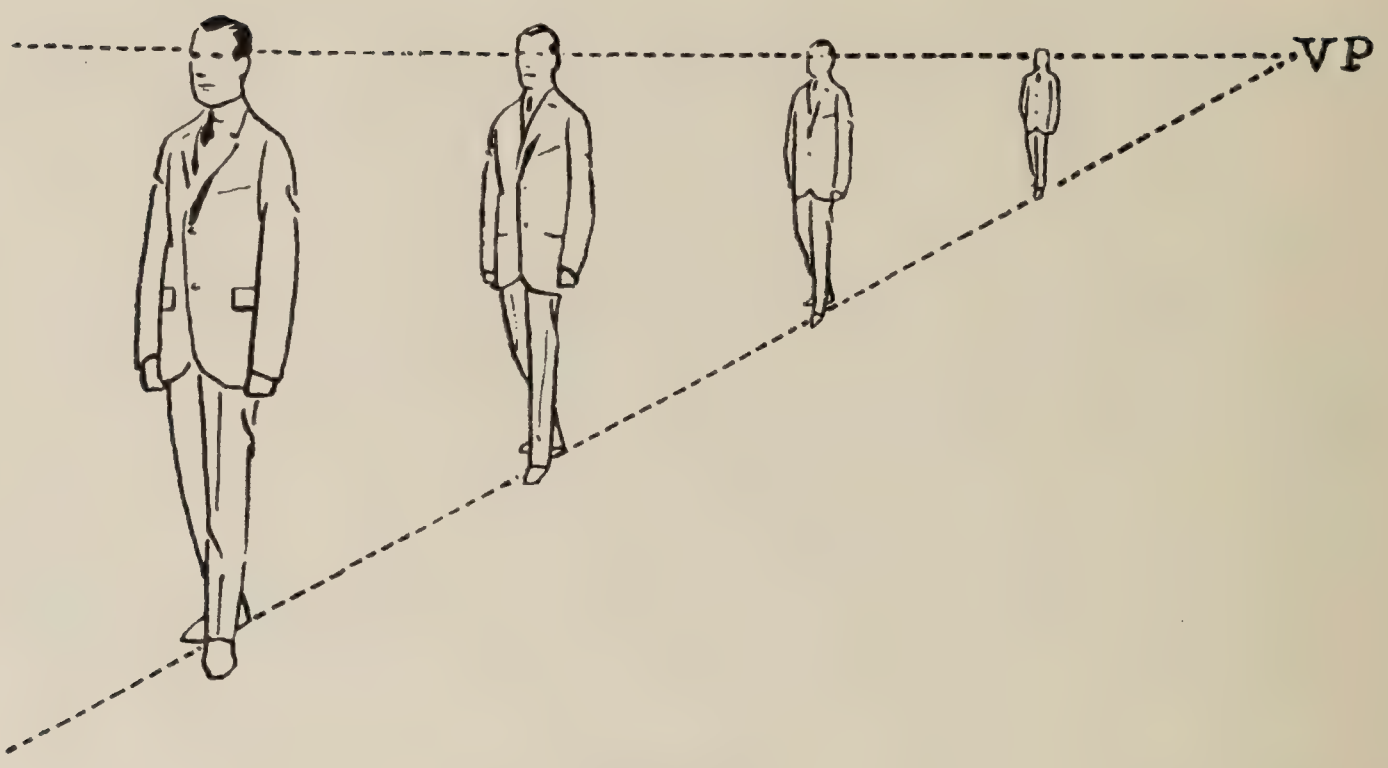


Figure 9A

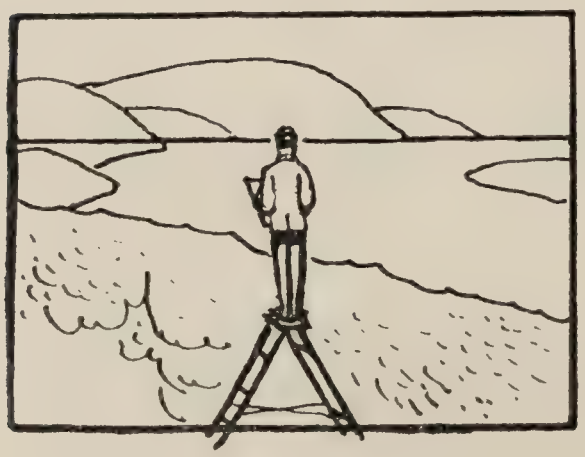


Figure 9B

8. Vanishing Point (V.P.)—

This is the point in the horizon at which all parallel horizontal receding lines converge.

In parallel perspective there will be but one vanishing point, and it will correspond with the centre of vision.

In angular perspective there will be at least two vanishing points. Their position on the horizon line will depend upon the angles at which receding lines leave the base line. (See Figures 1, 2, and 11.)

9. Measuring Point (M.P.)—

This is a point on the horizon line to which a line is drawn from a measurement or a scale on the base line, or ground line. The line drawn is called a *measuring line.*

To find the measuring point in the *parallel* perspective diagram (see Figure 2), from the vanishing point as a centre and the spectator's point as a distance, strike a semicircle to intersect the horizon line to the right and to the left. These points of intersection will be measuring points.

To find the measuring points in the *angular* perspective diagram (see Figure 10), from the right and left vanishing points as centres and the spectator's point as a distance, strike two arcs to intersect the horizon line. These points of intersection will be measuring points.

To measure distances along receding lines, the required measurement must be made along the base line from the point where the receding line meets the base line. If this measurement is made to the right, draw the measuring line to the left, and vice versa. The point where this measuring line intersects the receding line marks the required distance along it into the background. *All such measurements must be made along the base line.* Vertical measurements are made from the base line.

PROBLEMS IN PERSPECTIVE

Problem A in Parallel Perspective

Draw in parallel perspective a cube measuring one inch each way, resting on the ground and touching the picture plane (that is, at the base line). The assumed distance of the spectator from the picture plane is to be represented by a line 5″ long from S.P. to C.V.; the assumed height from the ground to the eye of the spectator is to be represented by 2½″ (from the base line to the horizon line).

First, draw the perspective diagram. (See Figure 2.) Draw the horizon line at least 10″ long. At its centre mark the C.V. From the C.V. at right angles to the H.L. draw the L.V. to the S.P. 5″ long. With C.V. as a centre and C.V.-S.P. as a radius, draw the semicircle cutting H.L. at L.M.P. and R.M.P. Parallel with H.L. and 2½″ from it, draw the B.L. This constitutes the parallel perspective diagram for this problem.

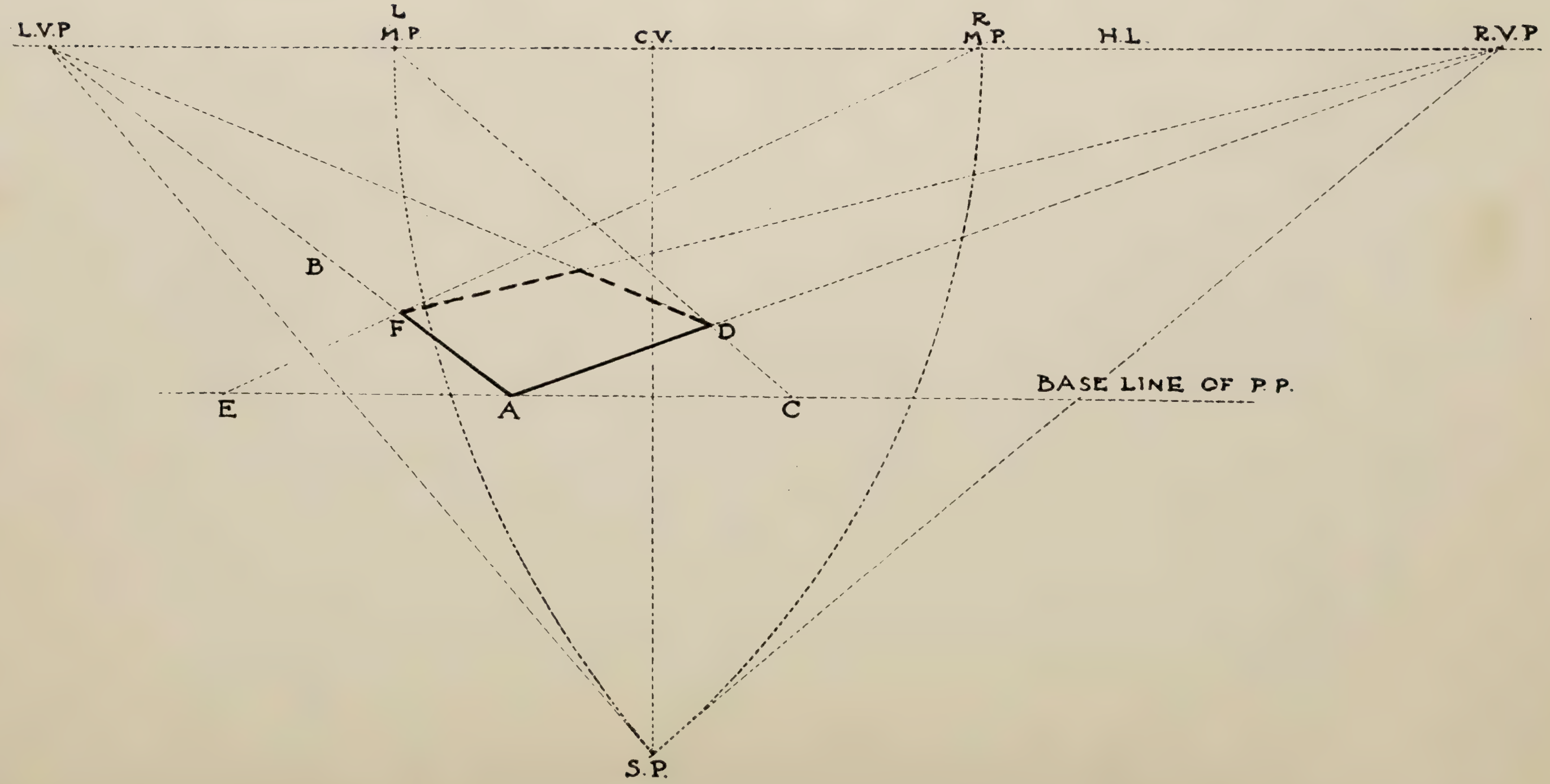


Figure 10

Second, draw the cube. Upon B.L., facing S.P., draw a square 1″ to a side. This represents the front of the required drawing. Connect each of its four corners with C.V. The width and the height of the cube being known, the real problem is to find the depth. From G, which is 1″ from H, draw a measuring line to the R.M.P. intersecting H-C.V. in 5. H-5 is 1″ long. Draw 5-4 parallel to G-H. From 4 and 5 draw vertical lines to meet the lines running from the two upper corners of the front square. The visible lines of the cube may now be lined in more strongly. This cube (A) may be constructed to the right or left upon the L.V. within a range of 60° of the spectator. (See Figures 6 and 8.) The *fact* of the correctness of this drawing is here illustrated. The *proof* of it must be left to the more advanced study of perspective.

Problem B in Angular Perspective

Draw in angular perspective a cube measuring 2″ each way and touching the base of the picture plane at a point 1″ to the left of the L.V. The height and the distance are the same as in Problem A.

We shall construct this cube in two diagrams; in the first finding the square base of the cube (see Figure 10), and in the second completing the problem. (See Figure 11.)

First, draw the perspective diagram. (See Figure 10.) Draw the H.L., L.V., B.L., with C.V. and S.P. as in Problem A. The vanishing points and the measuring points along the horizon line will vary according to the angles at which the receding lines of the cube will leave the base line. They may be fixed as follows:

Measure 1″ to the left of the L.V. along the B.L. to the point A where the base of the cube touches the B.L. From A to the H.L. draw a line making one of the required angles with B.L. and meeting H.L. in L.V.P. This will give one vanishing point.

Join L.V.P. to S.P. (See Figure 6.) At S.P. draw S.P.-R.V.P. making with S.P.-L.V.P. a right angle and meeting H.L. in R.V.P. This gives a second vanishing point.

To find the measuring points, with either vanishing point as a centre and with a radius equal to its distance from the S.P.,

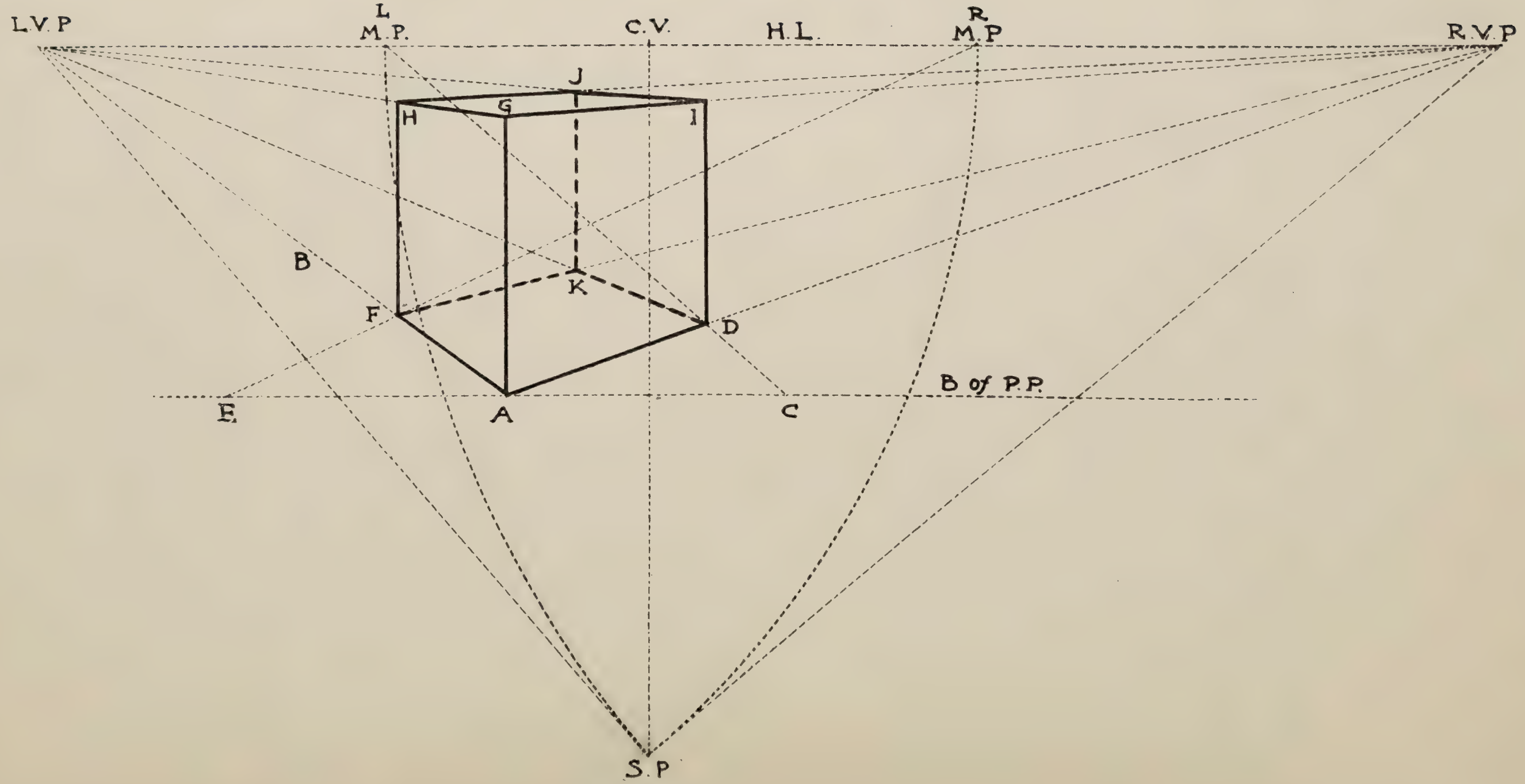


Figure 11

describe arcs cutting H.L. in L.M.P. and R.M.P. This constitutes the angular perspective diagram for this Problem.

Second, draw the cube. Draw a line from A to R.V.P. Then FAD represents the nearest right angle at the base of the cube to be drawn. To find 2″ along these receding lines measure 2″ along the base line from A to C and from A to E. Join E with the R.M.P., and C with the L.M.P., and where these measuring lines cut the receding lines at F and D, we obtain AF and AD, each 2″ long. Join F with the R.V.P. and D with the L.V.P., and the square base of the cube is found to be represented by FADK, Figure 11.

We now refer to Figure 11 for the completion of the drawing. As all measurements are made from the picture plane, and as in this case the cube touches the picture plane, from the nearest corner A erect a perpendicular line 2″ in height to the point G. From the point G draw vanishing lines to the right and the left vanishing points. From the points F and D draw perpendicular lines to H and I. From these two points to the opposite vanishing points draw vanishing lines intersecting at the point J. Lines JH and JI complete the top of the cube. The back corner of the cube, which is invisible, can be found by drawing a perpendicular line from K to J.

Problem C in Angular Perspective

Draw in angular perspective a cube of the same dimensions as in Problem B, placing it 1″ to the left of the line of vision, and *1½″ within the picture plane.* Employ the same height, distance, and angle as in Problem B.

First, draw a new perspective diagram like the one used in solving Problem B. (See Figure 12.)

Draw the horizon line, the line of vision, and the base line of the picture plane as in Problem B, marking the vanishing points, the centre of vision, and the spectator's point, and finding the measuring points as already described in Problem B. We now find the position of the cube. From the line of vision on P.P. measure 1″ to the left. This point A is where the cube would touch if brought forward to the P.P. To locate this point 1½″ within the P.P., where we are to draw it, from point A draw a line to C.V. on the horizon line.

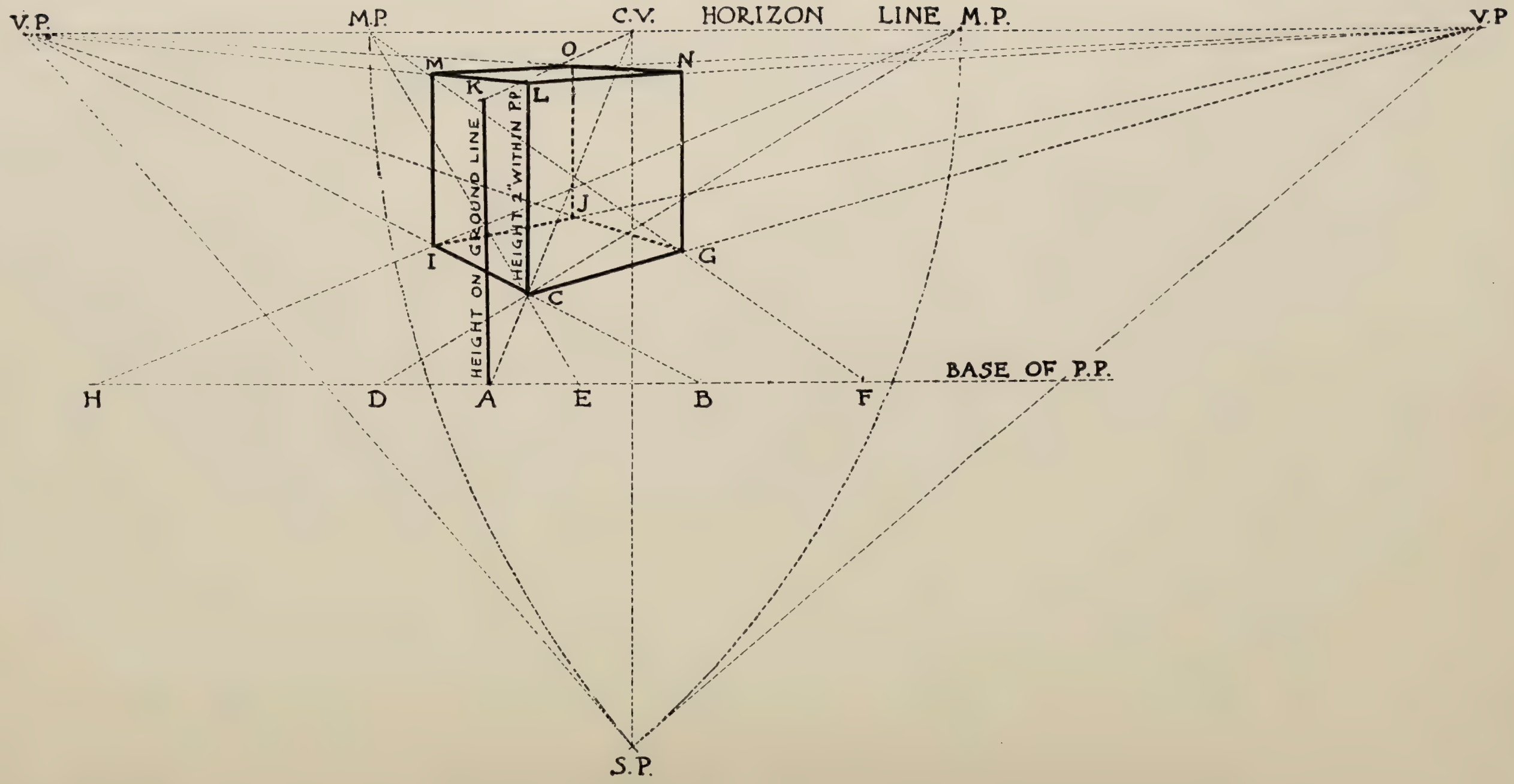

V.P.
M.P.
C.V.
HORIZON LINE
M.P.
V.P
M
O
N
K
L
HEIGHT ON GROUND LINE
HEIGHT 2" WITHIN P.P.
J
I
G
C
BASE OF P.P.
H
D
A
E
B
F
S.P.

Figure 12

Under the conditions of this Problem, the front corner of the cube must recede from the P.P. to the horizon along this line.

To find the point 1½″ within the P.P. along this line, from point A to the right along the base of the P.P. measure 1½″, establishing point B. From point B draw a line to the left vanishing point, cutting the line A-C.V. at C. This will be the nearest corner of the base of the cube. From the point C draw a line to the right vanishing point. The two front sides of the cube will be found on the lines C-V.P. to right and to left.

The procedure of finding the location within the P.P., or the point C, has been similar to finding the depth of receding lines in parallel perspective. The first two sides of the base of a cube in angular perspective *within the P.P.* are always located in this manner.

These being found, the measuring points are used to find the depth and width as follows:

From the two measuring points through point C draw lines to the base of the P.P. to D and E. The cube being 2″ square, to find the width, from point E measure 2″ to the right on P.P. to point F. Draw a line from point F to the L.M.P., giving us the width of C G.

The depth is similarly found by measuring from point D 2″ to the left at H and joining H to R.M.P. This gives the depth I C as the front lines of the cube go to the vanishing points, their parallel back lines may now be joined from I and G to their opposite vanishing points, giving us the back corner J.

We next proceed to find the height. As all measurements are made from the base line of the P.P. at the point A which is 1″ to the left of the line of vision where the cube would touch if on the P.P., erect a perpendicular line the height of the cube, which is 2″.

From the top of the perpendicular at K draw a line to C.V. From the bottom corner of the cube at C draw a perpendicular cutting K-C.V. at L. This gives us the height of the cube, 1½″ within the P.P. From the point L draw lines to the opposite vanishing points. From the points G and I erect perpendiculars to M and N on these lines. The lines M L and L N represent the front sides of the top of the cube. To complete the top,

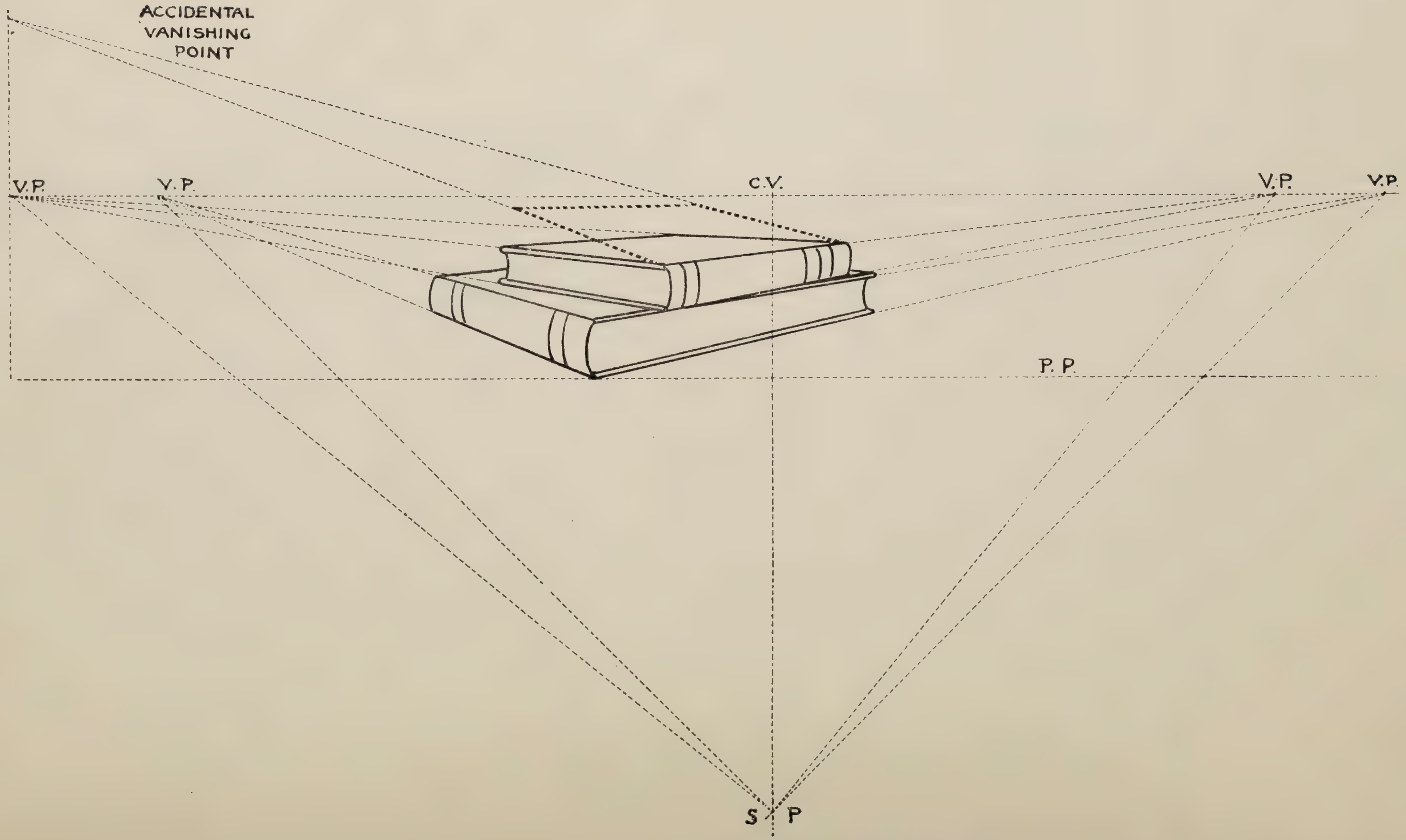


Figure 13

join M and N to their opposite vanishing points crossing at the point O. The invisible back perpendicular of the cube may now be completed by joining O and J.

Problem D in Angular Perspective

Draw two books in angular perspective slightly below the level of the eye, one lying on the other at a different angle. (See Figures 13 and 14.)

This Problem is intended to illustrate the fact that the vanishing points change as the angle of the object changes, and that the receding lines of all objects on horizontal planes must meet on the horizon line.

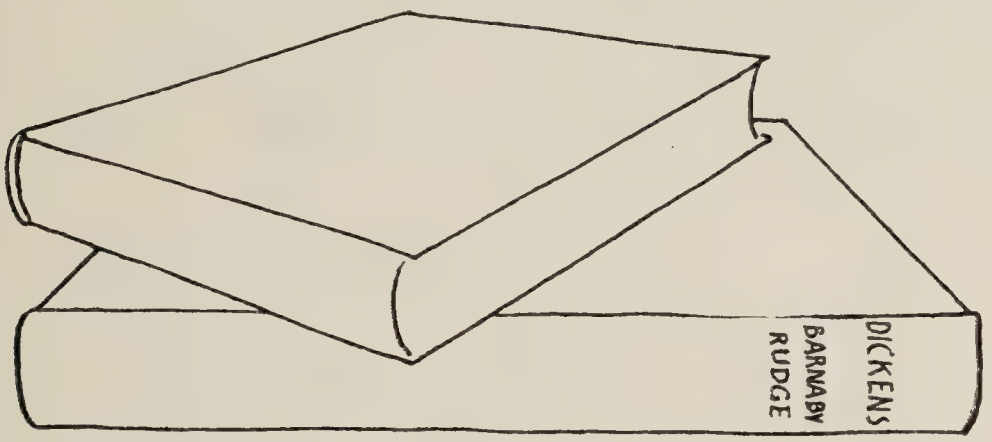


Figure 14

Also that when any object or side of an object departs from the horizontal plane, its lines do not converge on the horizon, but at an accidental vanishing point. (See the tilted cover of the book in the diagram of this Problem.)

This and similar exercises can be drawn without definite measurements; but enough of the mechanical perspective lines are shown to explain the problem of horizontal levels and change of angle.

POINTS TO NOTE IN THIS PROBLEM

1. The centre of vision remains the same.
2. The P.P. line is well away from the spectator, as the books are only slightly below the eye.
3. In this case the vanishing points of the lower book are equidistant from C.V., because the angles made by the retiring sides with the P.P. are equal, namely, 45°.

4. The angle of the upper book being different, its vanishing points change, the lines from the vanishing points to the S.P. forming a right angle in both cases.

5. The lid of the book is opened to show what happens when the plane is tilted off the horizontal, causing an accidental vanishing point which is above the horizon line and directly above its original vanishing point.

Miscellaneous Problems in Perspective

TO FIND CENTRES

To find the centre of any square or rectangle in perspective, draw both diagonals. The centre of the area will always fall where the diagonals cut. This is the way to find the middle of the end wall of a building in perspective, in order to draw the ridge of the roof. (See Figures 4 and 16.)

TO DRAW A PYRAMIDAL SHAPE IN PERSPECTIVE

First draw in the rectangular box of skeleton lines that would inclose the shape. The form can easily be completed by finding the centres with the diagonals, as just explained, and drawing lines to the centre as in Figure 15.

These construction lines can be largely eliminated after you are more familiar with perspective.

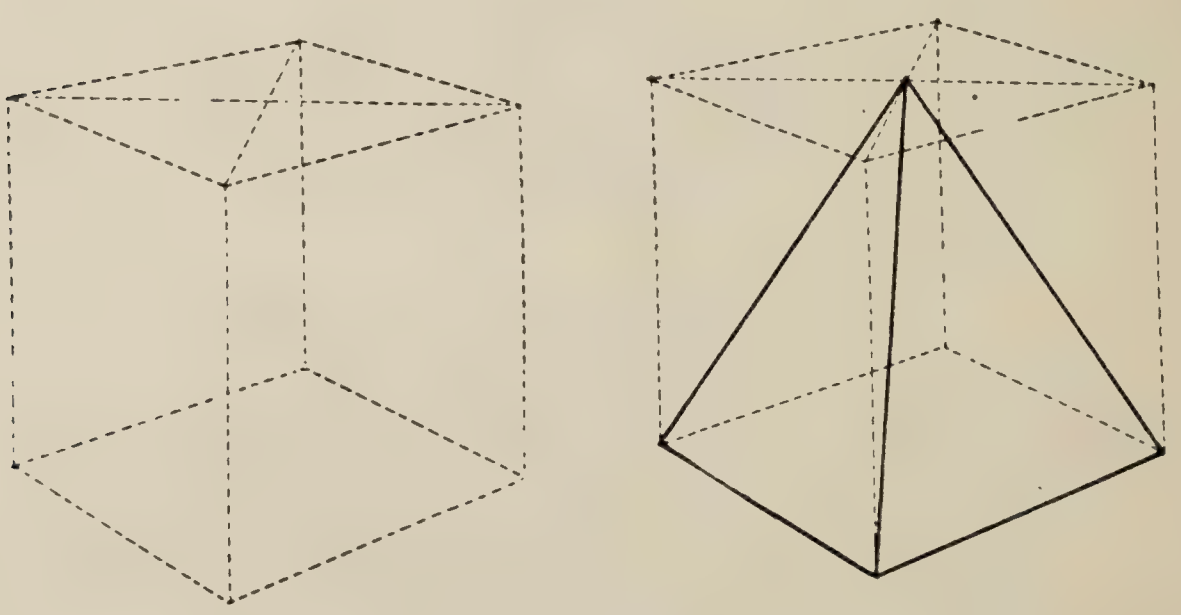


Figure 15

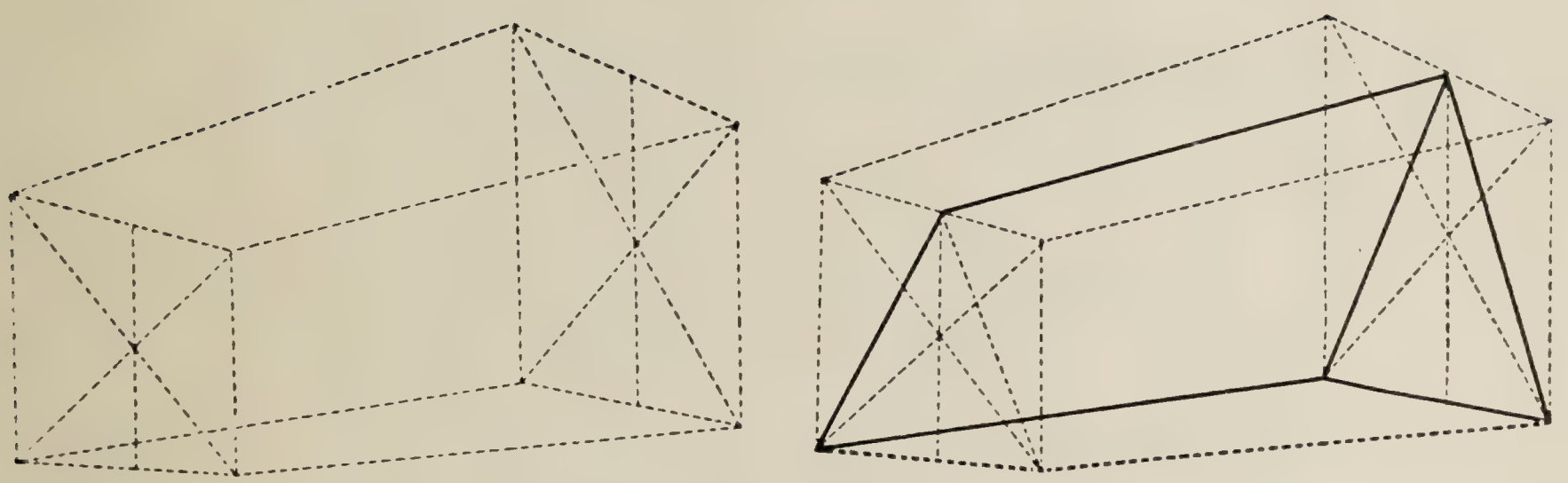


Figure 16

TO DRAW A CIRCULAR FORM IN PARALLEL PERSPECTIVE

Figure 17 illustrates a simple plan for drawing a circle or end of a cylinder horizontally in parallel perspective.

A square is first fitted to the given circle, and its diagonals and diameters are drawn.

Through the points of intersection of the circle with the diagonals of the square (ABCD), vertical lines are drawn, which when rotated into the horizontal position, fix similar points along the diagonals.

Through the eight points thus fixed (EAFCGDHB) in the perspective square, the line of the ellipse may be accurately drawn.

It will be observed in the ellipse of Figure 17 that the horizontal diameter of the square does not correspond with the horizontal diameter of the ellipse (not here shown). Each half of the ellipse must be the same. Yet the rear half of the perspective square is here smaller than the nearer half.

(The student should draw a line to express the diameter of the ellipse. He will then see that it is forward of the diameter of the square.)

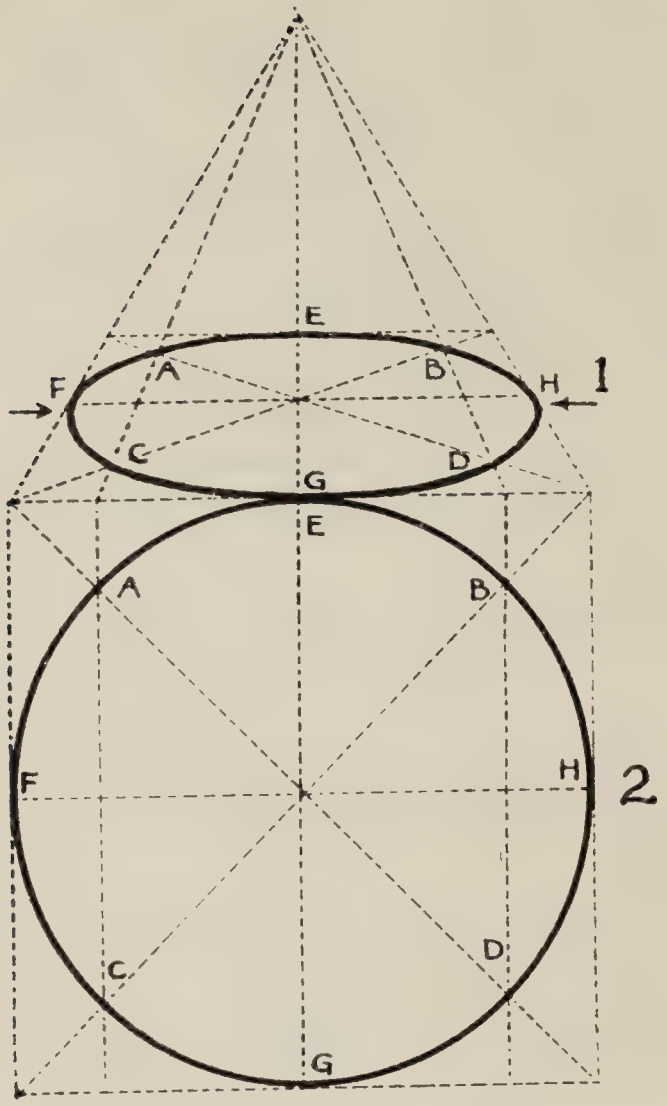


Figure 17

Figure 18 illustrates the evolution of the circle in parallel perspective horizontally placed above, below, and on a level with the eye.

The examples of the joining of two ellipses to make a cylinder, shown in this Figure, plainly illustrate the relative difference of the circular ends of a cylinder in parallel perspective.

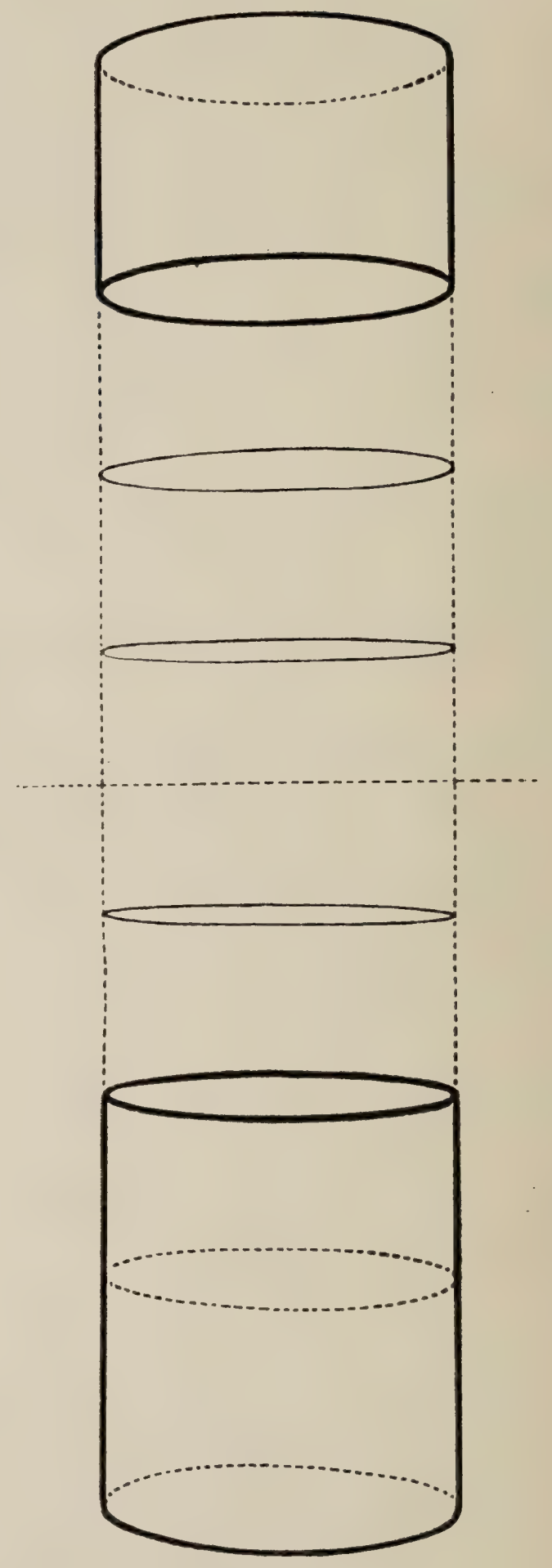


Figure 18

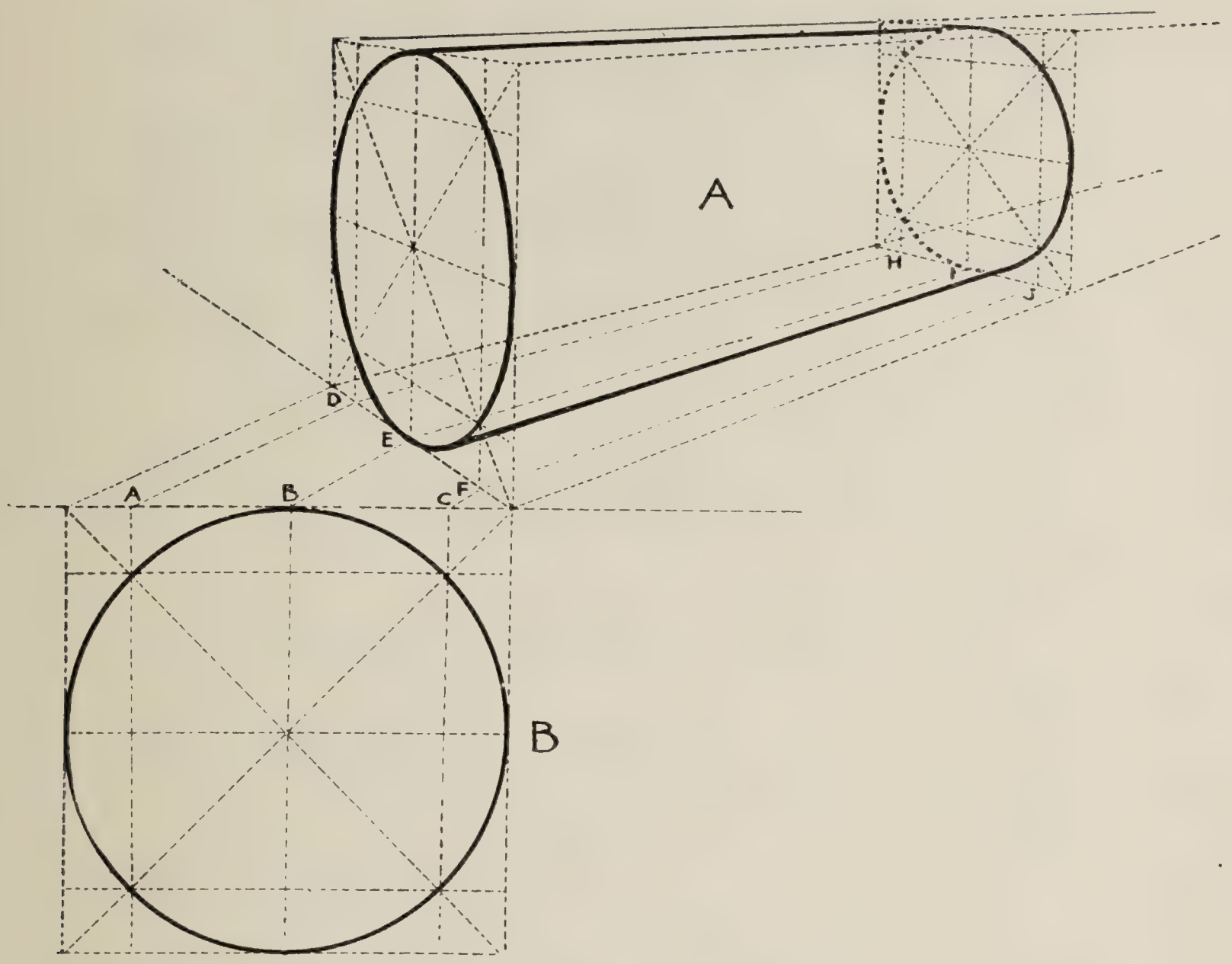


Figure 19

Figure 19 illustrates the relative differences of the circular ends of a cylinder in angular perspective.

TO DRAW A CIRCULAR FORM IN ANGULAR PERSPECTIVE

When the circular form is directly in front of and on a level with the eye, it, of course, does not change, and may be drawn with a compass. (See Figure 17.)

But when, as usually happens, it is in some other position, the outline takes the form of an ellipse.

Experienced artists can usually draw these ellipses accurately enough without the aid of mechanical perspective, but they always, either consciously or unconsciously, reduce this ellipse

to the squared shape which confines it. To arrive accurately at any circular form in perspective, it is first necessary to draw this square shape surrounding it in its proper perspective.

To assist in getting the proper shape and slant of the ellipse, draw the diagonals and the diameters and the vertical and horizontal lines which pass through the intersections of the diagonals of the square with the circle drawn within it. With the aid of the eight points thus obtained, the ellipse corresponding to the circle may be quite accurately drawn. (See the upper ellipses in Figure 19.)

This Figure also illustrates the method of drawing a cylinder in perspective, by first placing in perspective a square prism, at the ends of which the contained circles have been developed into ellipses.

It should be noted:

1. That the sides of the cylinder are drawn tangent to the ellipses.

2. That the diameter, or major axis, of the resulting ellipse, when below (or above) the eye level, is slanting, and therefore does not correspond with the diameter of the square in perspective.

3. That the axis of the cylinder (or lines joining the centres of the circles in perspective) is at right angles to the diameters of the ellipses representing the ends of the cylinder.

(The axis and the diameters have not been drawn in this Figure, but the student may test the truth of the statement by drawing them.)

4. That a cone may be constructed by joining the centre of either ellipse tangentially to the other. (The student should do this.)

The Mechanical Problems in perspective which we have given are intended to impress fundamental principles on the student's mind. It is seldom necessary to carry out Practical Problems with this degree of accuracy in regard to the working out of measurements. For architects it is a necessity, as they continually work to scale. Illustrators, of course, should have accurate perspective, but not necessarily to a scale of measurement.

The horizon line and vanishing points should always be checked, and measuring points will often be found useful—especially in laying out such things as floors, walls, windows in a building, etc.

But whether working to a scale or not, the understanding of the fundamentals of perspective gives an artist a sureness of construction that immediately takes his work out of the untrained and amateurish class.

A few problems in the practical application of perspective are here given, showing that, when the basic form of an object is correct in perspective, that object may be elaborated to any extent desired.

Figure 20 shows the evolution of a table from a rectangular form. In drawing any such object, the foundational form should first be put in correct perspective with the rest of the picture.

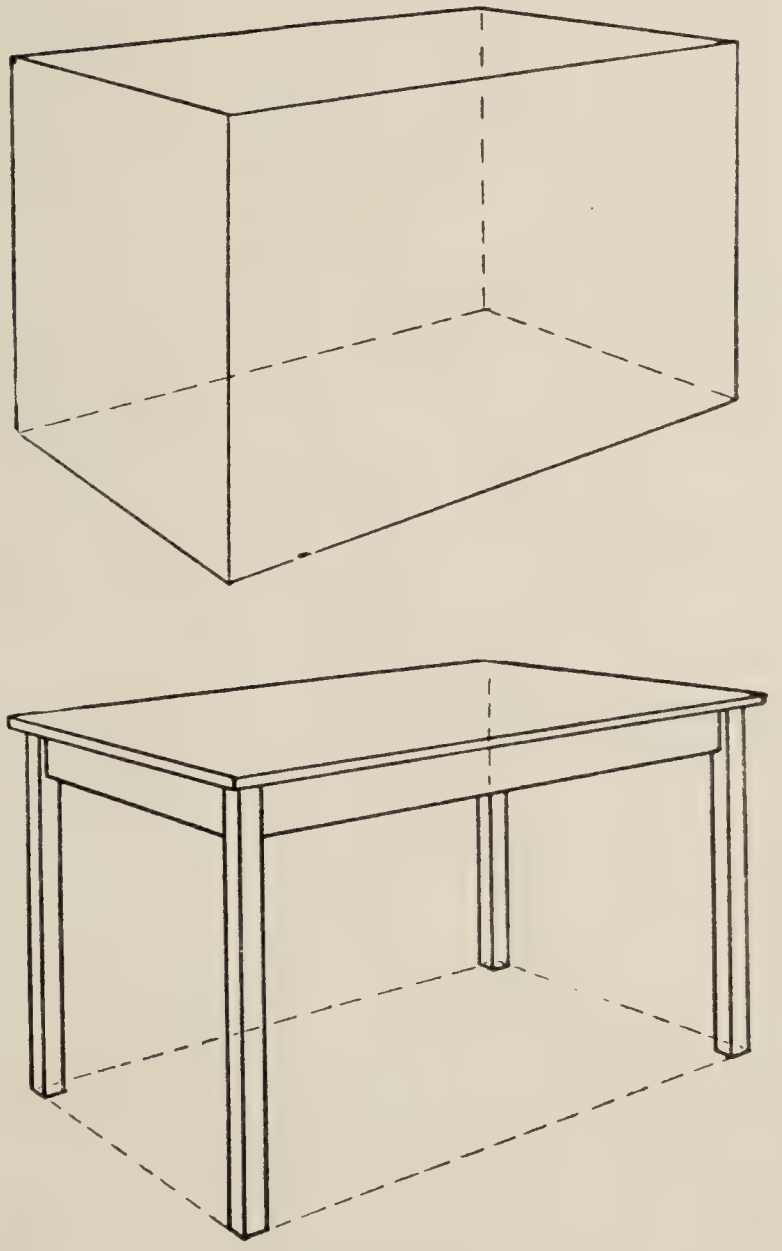


Figure 20

Figure 21 shows the evolution of a barrel from a cylindrical form. There are many chances to go wrong with a barrel, and the ellipses of the hoops, etc., should always be carried out completely in construction lines. (See dotted lines on the drawing.)

Note that the third hoop from the top, A, has a bigger ellipse than the bottom hoop, B, although A is nearer the horizon. This is accounted for by the fact that the diameter of the barrel is much larger at A than at B.

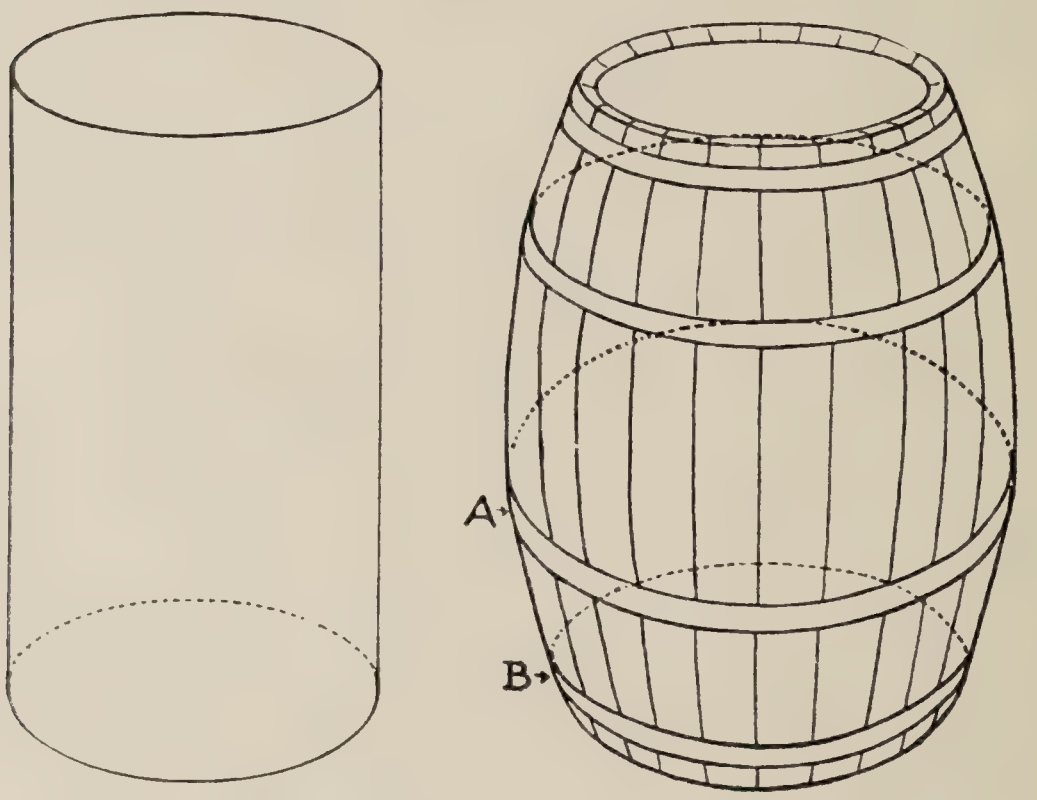


Figure 21

THE PERSPECTIVE OF INTERIORS

Rooms in Parallel Perspective

It should be remembered that, if we stand in a room with our backs to the front wall, the range of our vision will not allow us to see the whole room at once. The corners to right and left of us will be out of range. It can be drawn in perspective, but it is impossible to see the whole room in actual vision.

In drawing the interior of a room or half a room, the first thing to consider is where the eye level, or horizon line, would be. If the artist were standing, the eye level would be just the height of his eye if he were standing against the far wall. The height of a door frame will illustrate the correct proportion to a room (Figure 22A).

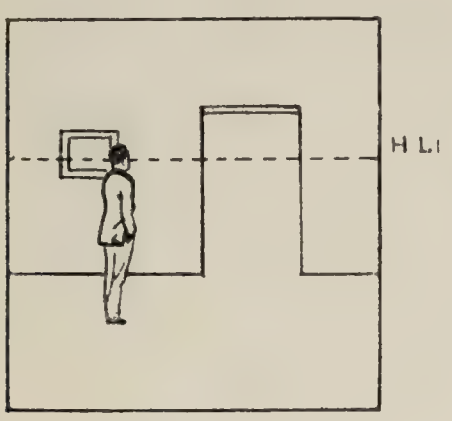


Figure 22A

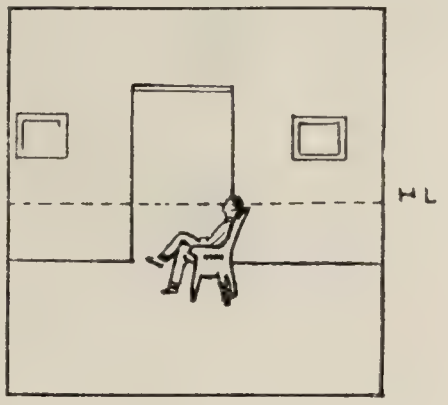


Figure 22B

If he were sitting, the eye level would be lower (Figure 22B).

The heads of the people in the room would have to be considered if standing or sitting.

If the room were seen in angular perspective, the same rule would hold good.

If seen from a gallery or flight of stairs, the eye level, or horizon, would rise.

If the room or hall were seen as the spectator's head reached the level of the floor as he came up a flight of stairs, the eye level would be on the same line as the floor. All receding lines would run to the V.P. on the floor level.

Figure 23 shows the interior of a room in which the far wall is parallel to the P.P.

The first thing to find is the eye level, or horizon, then the vanishing points, which would be directly forward from where we stand. To this point all the receding lines of the wall, floor boards, beams of the ceiling, sides of the furniture, etc., *if placed parallel*, would be drawn. But when the furniture is placed at another angle, the laws of angular perspective must be used for that particular part.

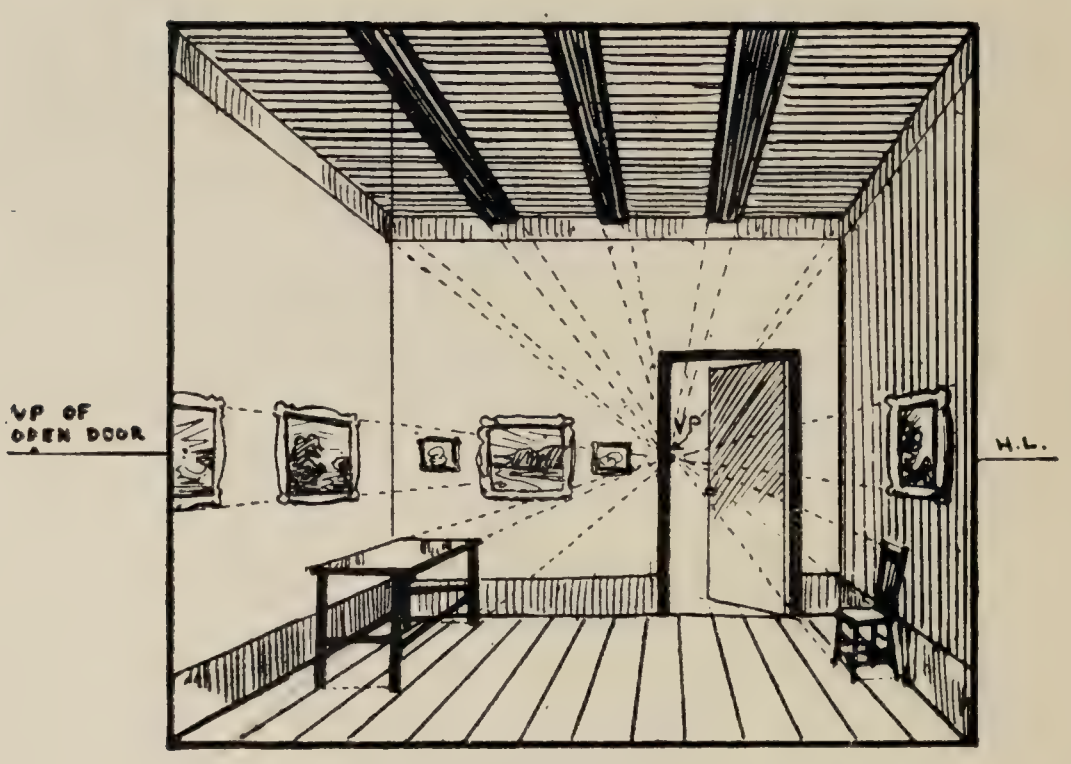


Figure 23

Rooms in Angular Perspective

Figure 24 shows a room at an angle. The laws of angular perspective govern this drawing, and two vanishing points are necessary. The lines of the walls, floor boards, and furniture, if placed parallel to the walls, would continue to either vanishing point.

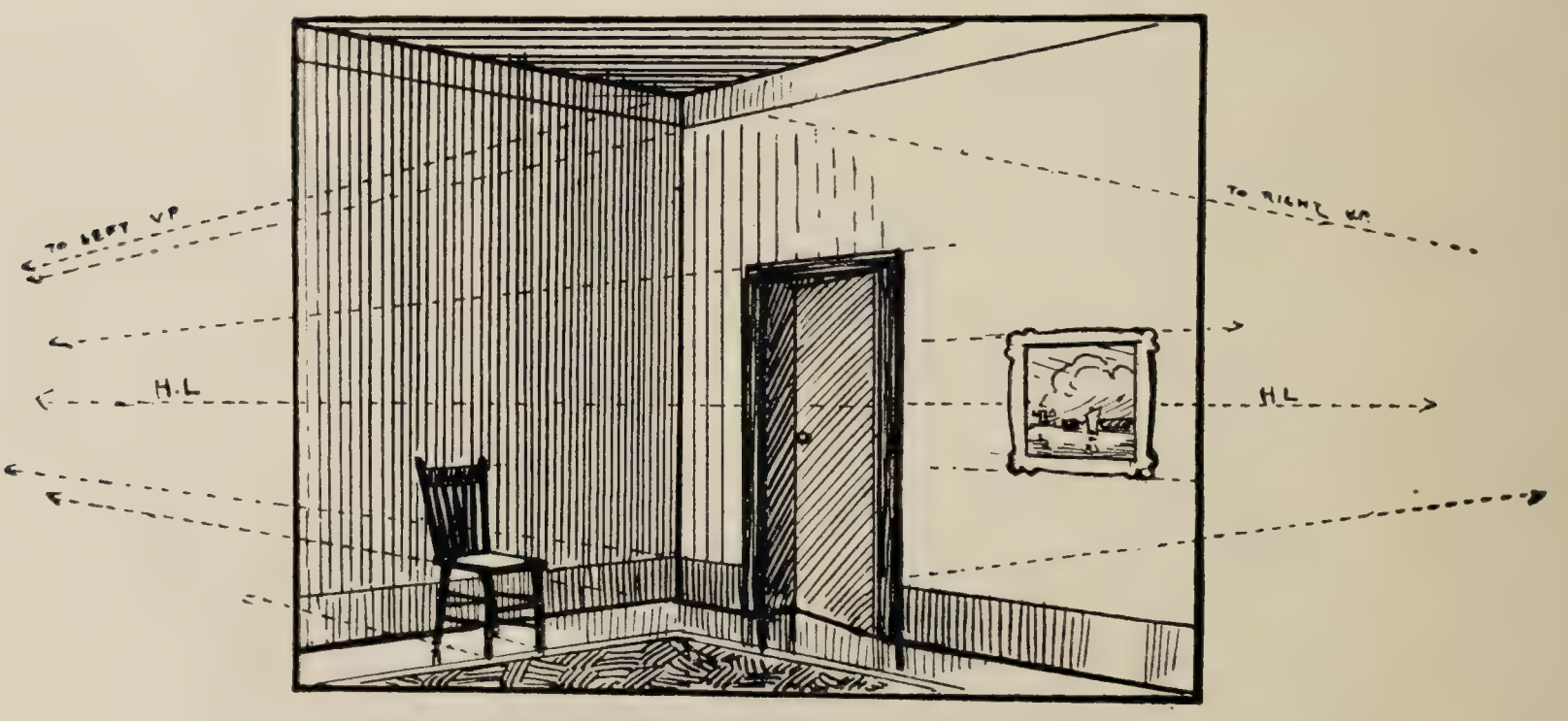


Figure 24

A ground plan of the floor area could be drawn, with position of furniture marked, and then the room drawn with the furniture in its proper place and proportion. The height of figures in the room would be governed by the same rules of perspective, whether seated or standing.

If the student understands the laws of elementary perspective as already explained, he should find little difficulty in drawing the interior of a room and placing the articles of furniture, etc., in it in a correct manner. Set yourself a problem and work it out.

The Angle of Open Doors

Figure 25 illustrates how to draw a door in correct perspective when placed at various angles from the door frame.

Points A, B, C, and D, indicate the corners of the door frame. The door swings on its hinges from the line of the door

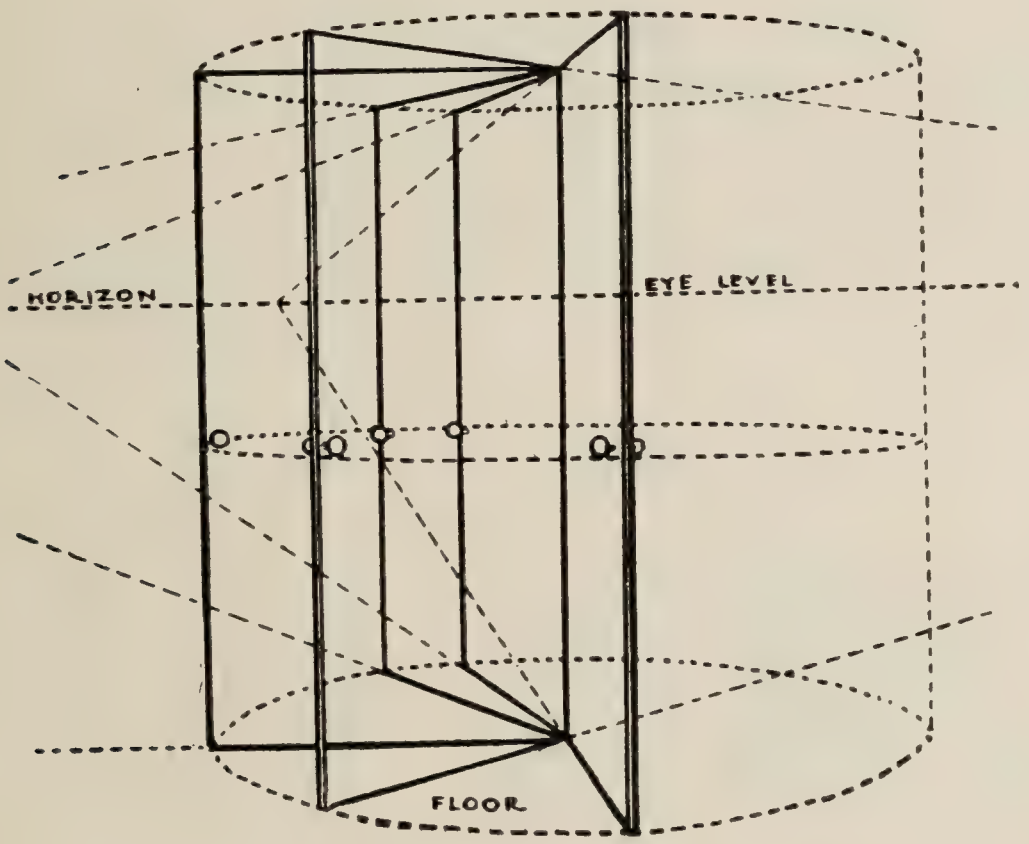


Figure 25

frame B-C. If the door could swing right around the circle with no wall behind it as a revolving door, it would swing in a circle. From the closed position to the open, full, or turned back against the wall at E, the door describes a half circle.

The eye level being more than half-way up the door, the ellipse that is described by the top of the door will not be so nearly a circle as the lower ellipse at the floor. The door at 2 and 3 is turned toward the spectator into the room, and at 1 and 5 turned back out of the room. As the door swings closed, it must follow the circle in perspective and meet the door frame. The diagram should make this perfectly clear.

If this is not understood, the student is apt to draw a door placed at an angle which if closed would not fit the door frame. The angle and position of the door knobs should be noted.

In every position, with the exception of closed or turned right back, the vanishing point of the top and bottom of the door will be somewhere on the horizon line at the eye level.

LEVEL AND INCLINED PLANES

As already explained, the receding lines of level planes will meet at the horizon line, or eye level. If they are on the eye level, they will appear as a horizontal line. If above, they will recede downward; if below, upward.

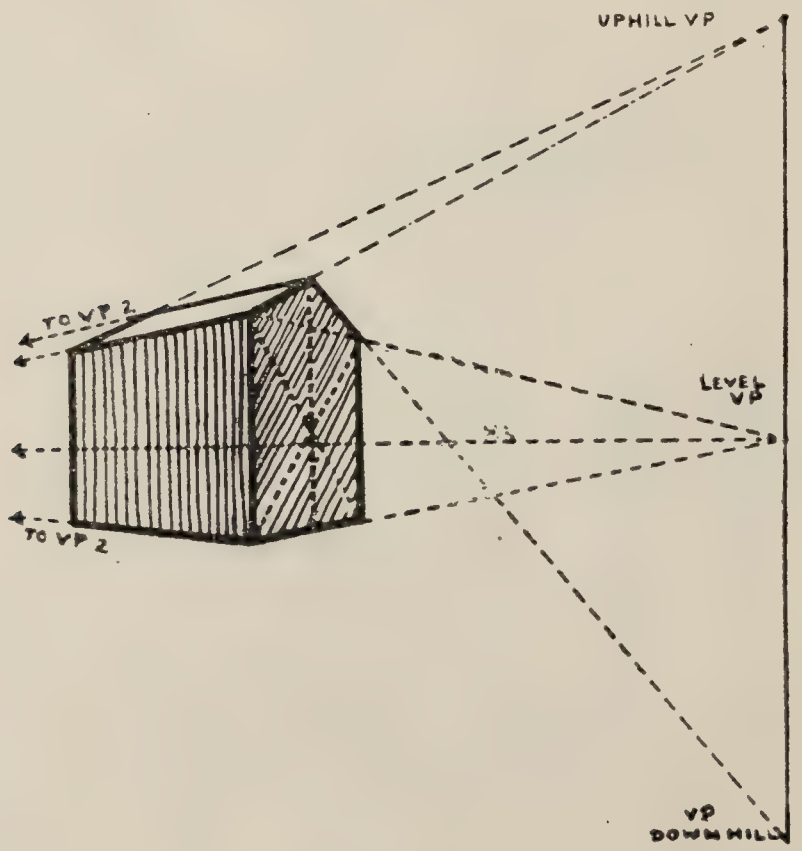


Figure 26

If the plane is tipped up at the far end without turning to right or left, you will find that the lines recede to a spot immediately above the former V.P., which point is called an accidental vanishing point.

The plane being turned upward is seen less foreshortened, and the V.P. is raised. The

same thing reversed occurs if the plane is tilted downward. All receding lines that in reality are parallel to each other, if tilted upward will go to a vanishing point immediately above the spot where they would have met if the plane had been on a level. This applies if the plane is tilted upward or downward.

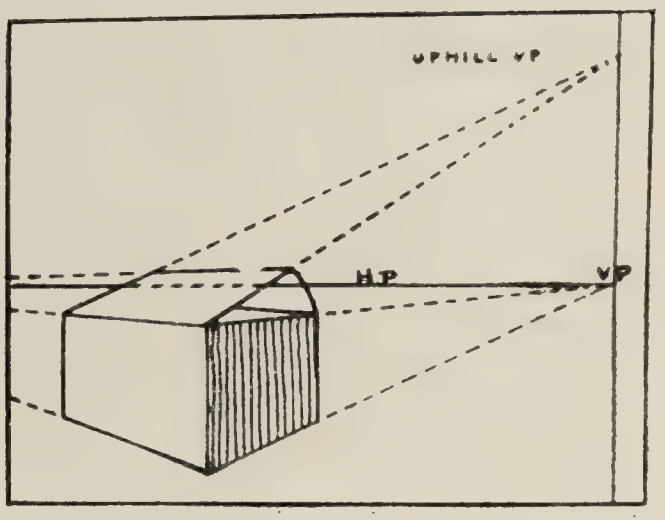
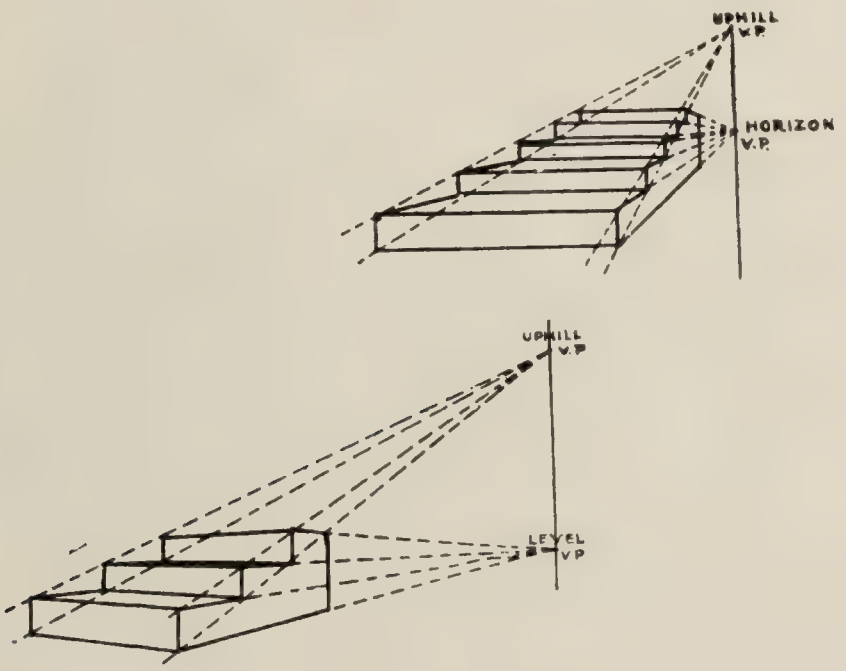


Figure 27

In Figure 26 the plane is shown tilted upward. Figure 27 shows how the sides of the roof of a house recede to an upper and lower accidental V.P. which are found somewhere above and below the V.P. of the flat roof.

TO DRAW STAIRS

Figures 28 and 29 show two sets of receding steps. Note the two vanishing points, one at the eye level, or natural horizon; the other an uphill V.P., to which the lines of the inclining edge of the steps recede.



Figures 28 and 29

BUILDINGS ON A STREET RUNNING UPHILL OR DOWNHILL

It is often very confusing at first to the artist when drawing a street running up or down hill, since the buildings are constructed on a descending or an ascending plane. It is necessary in such a problem to have two V.Ps.—one on the horizon, or eye level, which is the natural V.P.; the other will be above or below it.

Figure 30

The floors, roofs, windows, and doors of the buildings must be level, in spite of the slope of the ground. Their horizontal lines must recede to the level V.P., but the lines which indicate the scale will pass to the up or down hill V.P.

In Figure 30 we have an example of a downhill street with buildings. The downhill vanishing point is at the bottom of the hill at the water's edge. The natural V.P. on the eye level is on the horizon, which in this case is very high in the picture.

In Figure 31 the street passes to an uphill V.P.

In cases where there are high hills in a landscape which rise shutting off the natural horizon, or eye level, the student should be careful to draw his level planes so that the V.Ps. of objects will find the correct vanishing point which is on the horizon *behind the hill.* Otherwise the ground will be all uphill from the immediate foreground to the top of the hill.

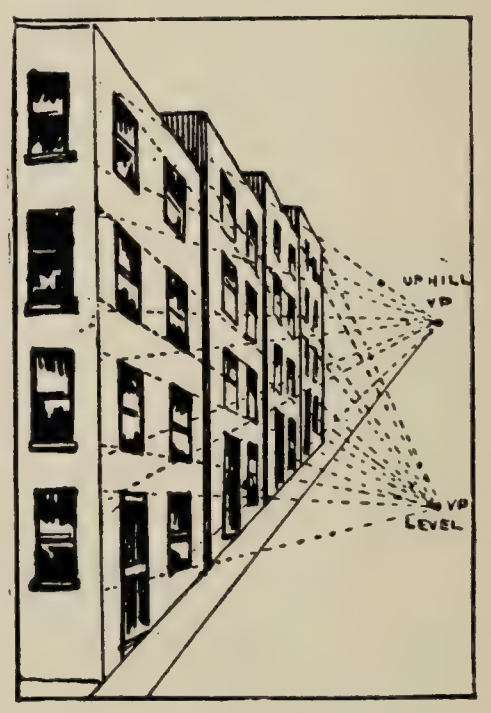


Figure 31

PROBLEMS FOR PRACTICE

1. Draw Problem A in parallel perspective, drawing each line in the order described. (See Figure 2.)

2. Draw Problem B in angular perspective, drawing each line in the order described in the lesson. (See Figures 10 and 11.)

3. With a horizon line of 10″, draw in angular perspective a rectangular solid 2″ wide, 5″ deep, and 3″ high, its nearest corner touching the P.P. on the line of vision and the vanishing points 5″ on either side of the centre of vision.

Use the same height as in Problems A and B.

In this Problem the top of the rectangle will be found above the eye level, or horizon line, and the vanishing lines of the top will recede downwards to the vanishing points.

4. Draw a box from a model or from memory:
   (1) Slightly below the eye level.
   (2) With the bottom on a level with the eye, the top being above the level of the eye.

5. Draw a cylindrical tin mug from the object or from memory:
   (1) Standing below the level of the eye.
   (2) Turned on its side below the level of the eye.

6. Draw an open book from the object, below the level of the eye:
   (1) In parallel perspective.
   (2) In angular perspective.

7. Draw a simple kitchen chair from the object.

8. Draw Problem C, drawing each line in the order described in the lesson. (See Figure 12.)

9. Draw the rectangular solid described in Problem 3, placing it 1½″ to the right of the line of vision and 2″ within the P.P.

10. Draw freehand a rectangular prism lying at an angle and below the level of the eye, and within it construct a cylinder.

In drawing the circular ends in perspective, use the method of locating eight guiding points as in Figure 19.

11. Draw freehand a simple table based on a rectangular form in angular perspective, the top slightly below the level of the eye. On it place a large book in parallel perspective. (Figure 20)

12. Draw a barrel, using the construction methods shown in Figure 21.

13. Draw the interior of a room—preferably a hall—in parallel perspective, that is, with the far wall parallel to the spectator. Place the door partly open in the far wall to the left-hand side of the centre. Suggest simple furniture placed parallel to the walls, also some pictures on the walls and a rug if you wish.

Do not over-elaborate this drawing. Keep it simple and pay special attention to the perspective throughout. Figure 23 illustrates the same position in perspective, but do not *copy* the same room. Be original.

14. Draw a portion of a room in angular perspective according to the principles illustrated in Figure 24, but using your own arrangement. Place a door in the left wall and a window in the right wall. Suggest one or two articles of furniture placed parallel to the walls.

15. Make a drawing of a flight of four steps similar in position to Figure 29, with a doorway at the top and the door standing partly open. To do this correctly, the vanishing points must be found, even if they fall outside the area of your drawing paper.

16. Draw in angular perspective below the level of the eye:

(1) A candy box with the half-open lid hinged at the back of the box. (See Figure 27.)

(2) A large book with several leaves slanting upward. (See Figure 12.)

17. Draw in angular perspective with the top above the eye level:

(1) A stable with the gable end showing to the left. (See Figure 26.)

(2) A wren house on a pole.

18. Draw:

(1) A warehouse at the side of a street going downhill to the lake. (See Figure 30.)

(2) A store fronting on a street slanting uphill. (See Figure 31.)

BIBLIOGRAPHY

For a review or for further study of the subject of perspective, the following books or portions of them are recommended:

1. Perspective for Art Students. R. G. Hatton. Chapman and Hall, London, England. The first 140 pages are especially helpful.

2. Freehand Perspective and Sketching. D. M. Norton. Published by the Author, Pratt Institute, Brooklyn, U.S.A. This work is accurate, readable, well illustrated, and very helpful throughout.

3. Art Education for High Schools, Part II. The Prang Educational Company, New York. There are about 40 pages of finely described and illustrated problems in freehand and in mechanical perspective.

4. Applied Art. Pedro J. Lemos, The Pacific Press Publishing Association, Mountain View, California, U.S.A. Pages 221-224 and 236-241 deal with perspective in a very simple and interesting way. Every teacher should possess this book for the numerous suggestions and clear explanations which it gives on very many parts of the Course in Art.

5. Complete Perspective Course. J. H. Spanton. The Macmillan Co., Ltd., Toronto. The first 47 pages of this work are elementary. The rest of it is quite advanced.

6. Perspective and the Making of Pictures. Vicart Cole, $4.50. Pitman.